

Why Embedded Intel® Architecture in Communications?

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Executive Summary

The communications industry is experiencing a rapid evolution, driven by pervasive trends that include the convergence of voice and data and the expansion of the bandwidth required to carry richer data types. These market dynamics create new challenges for developers, carriers, and end-users alike.

OEMs face the challenge of implementing scalable design solutions that can meet a wide variety of performance requirements. Today's increasingly competitive market dynamics also dictate that these solutions must be flexible enough to meet tight time-to-market demands. Finally, end-users are looking for ways to cost-effectively deploy new communications capabilities into existing network infrastructures.

Intel is committed to serving the communications industry through significant investments in new communications technologies that support the convergence of voice and data on the network infrastructure. In addition, Intel supports industry efforts to apply the proven scalability and fast time-to-market design environment enabled by embedded Intel® Architecture (EIA). Using EIA building blocks, development tools and reference platforms can provide a valuable head start in the development of new products, while enabling value-added features and future upgrades to be added in software. Development can be further enhanced by the variety of EIA-based software, operating systems, and board-level platform solutions currently available from third-party providers.

Trends Shaping Next-Generation Networks

Today's networks are rapidly evolving to support the next generation of services, influenced by these key trends:

- Burgeoning demand for bandwidth is creating the demand for new technologies that support higher traffic from the edge to the core, requiring equipment with higher port densities.
- Converged network architectures that blend legacy circuit-switched and modern packet-routed operations require a new generation of more easily configurable network elements, multi-service platforms, and integrated access devices (IADs).
- Mobile telephony and wireless Internet capabilities are driving demand for configurable solutions to support the increase in traffic from the network edge to the core.
- Complex network architectures and rapidly growing network traffic require a more robust, intelligent control plane, with more robust processing capabilities.
- The intersection of public and private networks requires equipment manufacturers to provide open-standards-based equipment capable of supporting multiple services.
- On the network edge, growth opportunities are being driven by the growing demand for digital loop carriers, optical network units, integrated access devices, routers and gateways, switches, cable modem termination systems, DSL

access multiplexers, remote access concentrators, wireless base station controllers, mobile switching centers, and satellite earth stations.

- Additional opportunities lie in upgrading existing servers and designing new ones required by operations support systems (OSS).

Why Embedded Intel® Architecture?

Embedded Intel Architecture processors, chipsets and other building blocks provide the combination of performance, scalability, and software-based upgradability to meet the growing requirements of next-generation networks at multiple levels of the OSI Application Services Layer. EIA reference designs for communications provide the performance to support demanding telecom services and applications, such as Voice over Internet Protocol (VoIP), telephony and billing services in second-generation and third-generation network appliances. In addition, embedded Intel Architecture processors provide the power to handle compute-intensive control operations. These include services and functions required by the application services layer, such as routing and signaling protocols and the control of policy, Quality of Service (QoS) and security.

Intel® Internet Exchange Architecture

The Intel Internet Exchange architecture (IXA), as shown in Figure 1, provides a consistent framework for OEMs and independent software vendors to quickly deploy new networking and communications services and develop differentiated networking products that deliver scalable performance with reduced total cost of ownership. Intel IXA includes end-to-end development solutions and building blocks that enable developers to create solutions for the entire Open Systems Interconnectivity (OSI) stack.

Embedded Intel Architecture delivers solutions that meet the performance requirements of the Application Services Layer of the OSI Model. By incorporating scalable embedded Intel Architecture components and software within Intel IXA, Intel is delivering a flexible top-to-bottom architecture that delivers high performance, scalability, code compatibility and programmability that enables faster and more cost-effective software-based product differentiation.

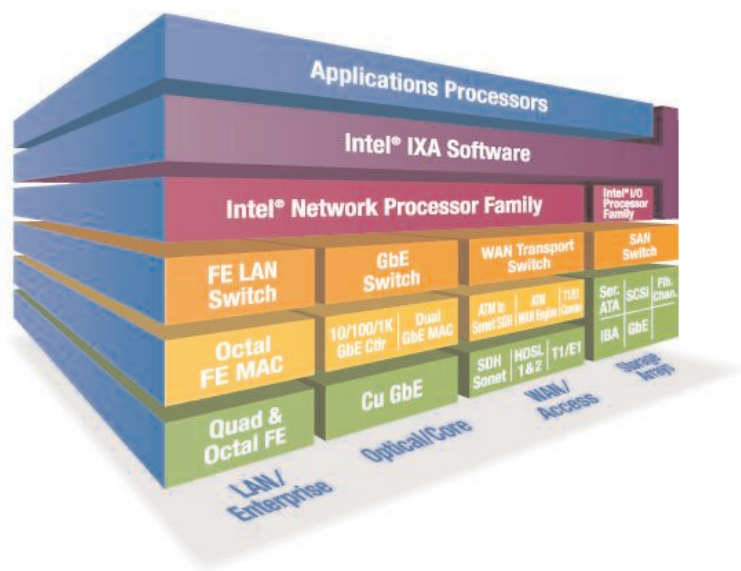


Figure 1 Intel® Internet Exchange Architecture

The Need for Performance

CPU and system-level performance have become increasingly important across a wide range of communications applications. Examples include network routing and switching, virtual private network and firewall security, web caching and storage. Other applications include QoS, policy management, load balancing, VoIP gateways, and multi-function devices such as combination Web, news and e-mail servers. While each of these application areas can include a gradation of performance levels and price points, the continuing convergence of voice and data make it increasingly important for developers to get high-performance applications and services to market ahead of the competition.

EIA for the Network Core, Edge, CPE and Clients

Embedded Intel Architecture can promote time-to-market and software-based product differentiation in devices designed to function at the carrier core level, at Internet access points on the network edge, in a wide variety of customer premises equipment (CPE) devices, and in dedicated end-point devices and fixed-function communications appliances.

In carrier core applications, embedded Intel Architecture processors support services and applications for the network, including SS7 call processing, network management and adjunct processing for computer telephony integration. EIA provides scalable and high-performance processing, with time-to-market platform-based solutions available from a variety of

third-party solutions providers. Specific applications within the network infrastructure include switches, routers, private branch exchanges and blades.

Access applications on the network edge include Web servers, and servers for voice, security and storage. CPE and dedicated communications appliances include products for network attached storage (NAS), Web caching, firewalls, virtual private networks (VPN), and multi-service access devices (MSAD).

EIA Components

To help developers meet application demands, Intel provides communications building blocks that provide the CPU performance of Intel® Celeron™ and Intel® Pentium® III processors. Designed for embedded applications, these processors provide the added flexibility of compact Flip-Chip Pin Grid Array (FC-PGA) packaging. CPU performance is augmented by the extended I/O throughput and high concurrency of Intel chipsets, memory and I/O devices. Processors and chipsets include:

- Intel® Pentium® III– Low Power processors combine high performance with efficient power consumption and are ideal for communications applications, particularly those with space-limitations and tight thermal envelopes.

- Intel® Pentium® III processors are ideal for high-performance devices including control functions for switches and routers and compute intensive applications including virtual private networks (VPNs) and virus/intrusion detection applications.
- Intel® Celeron™ processors add good performance at an excellent value, and allow you to design applications for a wide range of price/performance points.
- The Intel® 810 chipset adds an ATA/66 hard disk drive interface and support for the Intel Random Number Generator.
- The Intel® 440BX chipset supports scalable platforms with Celeron through Pentium III processors in the Socket 370 package.
- The Intel® 840 chipset delivers a new level of performance and bandwidth to Pentium III FC-PGA processor-based platforms used for high-performance applications including billings databases, (OCxx) routers, switches, base station controllers, Voice over IP applications, in addition to high-end appliances such as load balancers, VPN routers and caching devices.

Development Tools

Embedded Intel Architecture also includes a comprehensive array of development tools for performance analysis, software development, and hardware integration. The easy programmability and code compatibility of embedded Intel Architecture helps minimize time-to-market. Once their system hardware has been deployed, vendors can add differentiating features through software modifications. This platform-based approach to development maximizes the “time-in-market” for a given hardware design, and enables developers to easily implement value-added and innovative features without expensive re-engineering.

Embedded Intel Architecture has a number of other important advantages for developers, including:

- Support for a wide range of standard and real-time operating systems.
- Scalable reference designs for communications appliances and network infrastructure products.
- Embedded product life cycles to further maximize time-in-market.
- Low profile packaging adapted to small form-factor communications devices.
- Intel’s product roadmaps for a continuous, cost effective product evolution.

With its inherent designability, embedded Intel Architecture enables developers to focus their available resources on software applications and value-added services that will help sustain their competitive advantage.

Performance Throughout the Network Infrastructure

Embedded Intel Architecture supports application processing throughout the network infrastructure as shown in Figure 2.

Communications Appliances

Communications appliances enable organizations to be more agile and optimize infrastructure costs, while meeting the diverse requirement of emerging application demands including Network Attached Storage, Web caching, firewalls, virtual private networks, and Multi-Service Access Devices. This latter category of devices can address connection, security and storage needs within a single unit, including firewall, residential gateway and caching functions.

Conclusion: an Architecture with Many Advantages

Following is a summary of the advantages of embedded Intel Architecture for communications applications:

- **Time-to-Market** – The Internet economy places a premium on rapid product development. Embedded Intel Architecture is familiar to design engineers worldwide, with optimized tools to speed development. In addition, Intel reference designs support fast product design and manufacturability.

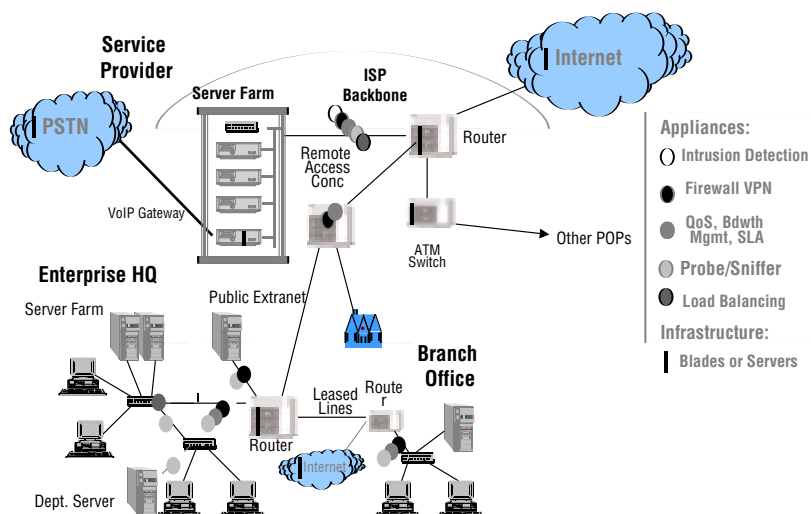


Figure 2 - Network Overview

- **Time-in-Market** – Intel components support embedded product lifecycles, and Intel reference designs support a platform-based architecture that enables developers to update product functionality through software upgrades, extending the life of hardware designs.
- **Scalability** – Embedded Intel Architecture supports scalable solutions in communications applications that serve a broad cross-section of market sub-segments, ranging from home and small/medium business at the low-end, to enterprise and carrier-class at the high-end.
- **Third-party Board Level Integration** – Board level solutions are currently available through Intel® Applied Computing Platform Providers (ACPPs).
- **High Availability** – Intel is working with OEMs to set minimum requirements for high availability systems.
- **Intel Quality and Manufacturing Capacity** – With its high volume manufacturing facilities and quality assurance programs, Intel is uniquely positioned to meet the growing needs of developers serving the communications market segment.

For More Information

More information on Embedded Intel Architecture solutions for communications, including block diagrams and reference designs, is available on Intel's Developer site at developer.intel.com/platforms/applied/comm

More information on the Intel Internet Exchange Architecture can be found on www.intel.com/IXA

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